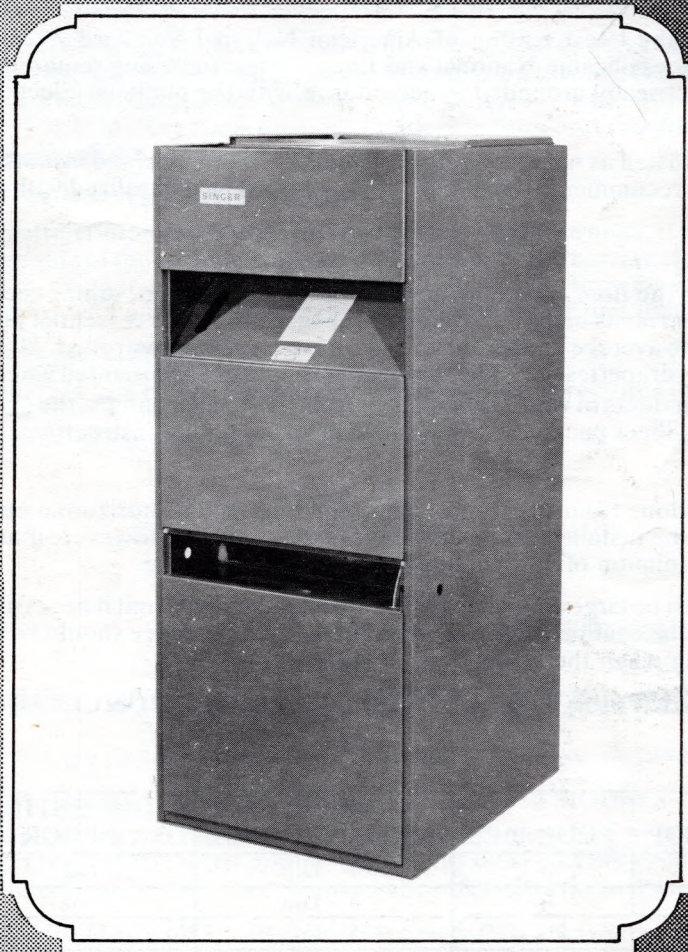


INSTALLATION INSTRUCTIONS AND HOME OWNERS MANUAL



G-U 312000 SERIES

**GAS FIRED
UPFLOW UNIT**

MANUFACTURED
BY

SINGER

CLIMATE CONTROL PRODUCTS

1300 HAMPTON AVE. ST. LOUIS, MISSOURI 63139

SINGER Gas Designed Furnaces Prewired & Preassembled

G-U SERIES

INFORMATION CONTAINED IN THIS MANUAL IS DESIGNED TO ACQUAINT YOU WITH THE MECHANICAL FEATURES, AND TO SERVE AS AN EMERGENCY REPAIR GUIDE IN CASE OF HEAT FAILURE.

PROPER CARE OF YOUR GAS FURNACE WILL ASSURE YOU OF MANY YEARS OF ECONOMICAL COMFORT AND SERVICE. LIKE EVERY PIECE OF FINE MECHANICAL EQUIPMENT, YOUR FURNACE SHOULD BE SERVICED PERIODICALLY BY AN EXPERT. WE RECOMMEND A COMPLETE SERVICING BY AN AUTHORIZED SERVICEMAN AT LEAST ONCE EACH YEAR — USUALLY AT THE END OF THE HEATING SEASON.

SECTION I

GENERAL INSTALLATION REQUIREMENTS:

UNCRATING AND INSPECTING

After uncrating the unit, inspect thoroughly for concealed damage, if found, notify transportation company immediately and file concealed damage claim.

All installations should be made as outlined in the latest edition of American National Standard Z223.1-1974, Z223.1A-1978 National Fuel Gas Code, and other applicable National and Local codes, including requirements of Local Utilities. In addition, the unit must be electrically grounded in accordance with the National Electric Code ANSI NFPA-1978.

Select a level spot for the installation of the unit. Install as near to the flue or chimney as possible and install the vent pipe with a minimum number of elbows. It is also recommended that if possible, the unit be centralized with relation to the distribution system.

LOCATION OF THERMOSTAT

Thermostat should be mounted 4 to 5 feet above the floor, on an inside wall of the living room, dining room, or a hallway that has good air circulation from the other rooms being controlled by the thermostat. It is essential that there be free circulation of air at this location, of the same average temperature as other rooms being controlled. Movement of air should not be obstructed by furniture, doors, draperies, etc. The thermostat should not be mounted where it will be affected by drafts, hot or cold water pipes or air ducts in walls, radiant heat from a fireplace, lamps, the sun, T.V., etc., or on an outside wall. Consult Instruction Sheet packed with thermostat for mounting instructions.

ACCESSIBILITY CLEARANCES

All servicing and cleaning of these units can be done from the front, and a minimum of 24" horizontal clearance should be allowed. If necessary, these units can be installed at the clearances listed below. However, if access is required to some other piece of equipment, a minimum of 18" should be allowed for passage.

In a closet or utility room installation, the door must be large enough to allow replacement of the unit if necessary or to permit replacement of any other appliance within the confined space. A minimum of 24" clearance should be allowed at the front of the unit for servicing and cleaning when the closet door is open.

THE ACCESSIBILITY CLEARANCES MUST TAKE PRECEDENCE OVER FIRE PROTECTION CLEARANCES

RECOMMENDED CLEARANCE GUIDE

INPUT BTU/HR.	FRONT	REAR	SIDES	TOP	FLUE PIPE	FURNACE FLUE PIPE SIZE	COMBUSTIBLE FLOOR
55,000	6"	0"	2" #	1"	6"*	4" Dia.	0"
80,000	6"	0"	1" #	1"	6"*	4" Dia.	0"
100,000	6"	0"	0"	1"	6"*	5" Dia.	0"
125,000	6"	0"	1"	1"	6"*	5" Dia.	0"
150,000	6"	0"	1"	1"	6"*	6" Dia.	0"
175,000	6"	1"	1"	1"	6"*	6" Dia.	0"
200,000	6"	0"	0"	1"	6"*	7" Dia.	0"

#May be 0 inch when type B-1 Vent is used.

*May be 1 inch when B-1 Vent is used.

DIMENSIONS ON UNIT CLEARANCE LABEL SHALL TAKE PRECEDENCE OVER ABOVE CLEARANCE TABLE

Where the flue pipe passes through combustible material, a listed insulated thimble whose diameter is 4" larger than the flue pipe must be used. Comply with all Local Codes on reduced clearances.

PROVISION FOR COMBUSTION AIR AND VENTILATION

In a closet or utility room installation, it will be necessary to provide combustion and ventilation air from an area of adequate air supply. In open basements of normal construction, an adequate supply of air is obtained from infiltration.

Any restricted installation requires two openings in the door or single wall of the closet or utility room. One opening should be located within 12 inches of the top and the other within 12 inches of the bottom of the enclosure.

The following minimum free area is required for these openings:

- a) Openings to interior space — Each opening to interior space must have a free area of at least 1 square inch per 1,000 BTU per hour input rating, but not less than 100 square inches.
- b) Openings to outdoors — Each opening to the outdoors must have a free area of at least 1 square inch per 2,000 BTU per hour input rating if horizontal air ducts are used, and 1 square inch per 4,000 BTU per hour input rating if vertical air ducts or openings communicating directly with the outdoors are employed.
- c) For other types of openings, refer to ANSI-Z223.1-1974 National Fuel Gas Code.

Air openings in the casing front, return air grilles, and warm air registers must not be obstructed.

DUCT CONNECTIONS

On any job, it is recommended that a flexible duct connection such as asbestos cloth collars or other non-flammable material be used for the return air and discharge connections to prevent transmission of vibration.

Never make an installation without a complete return air duct system. The return connection must be made full size to a location outside the utility room. Return air must NEVER be drawn from the inside of a closet or a utility room.

In addition, when the furnace is located in an area near or adjacent to the living area, the system should be carefully designed with returns to minimize noise transmission through the return air grille. Any blower moving a high volume of air will produce audible noise which could be objectionable when the unit is located very close to a living area. It is often advisable to carry the return ducts under the floor or through the attic. Such designs permit the installation of air return remote from the living area.

ADDITION OF AIR CONDITIONING

When a refrigeration coil is used in conjunction with these units, it must be installed in parallel with or in the warm air discharge side of the system to avoid condensation in the heating element. With a parallel flow arrangement, dampers must be installed to prevent chilled air from entering the furnace. If manually operated dampers are used, they must be equipped with a means to prevent operation of either unit unless the damper is in full heat or full cool position.

HIGH STATIC OPERATION

These blowers can be operated against external static pressures up to 0.5" water column, or as indicated on rating plate.

SECTION II

INSTALLATION PROCEDURE

These units are factory assembled and all the internal wiring and piping has been completed.

BOTTOM AIR RETURN (055, 080, 100, 125 and 150 MODELS ONLY)

If return air is to enter the unit from the bottom, cut opening in bottom, center and level the unit over the return air opening. If necessary, grout around the base to seal leaks between the unit and the floor. Insert air filter into guides cut into the furnace base. See inclosed sheet for directions. Proceed with duct work.

SIDE AIR RETURN (055, 080, 100, 175, 150 MODELS ONLY)

If the return air is to enter the unit from the side, it will be necessary to cut the return air opening in the side casing panel. Mark the opening to be cut, using the square embossed knockouts on the casing, if provided, as guides. Or refer to the installation instructions inserted in this booklet. Proceed with duct work.

When using the external filter rack, center the filter rack on the side panel, flush with bottom edge of the furnace. Mark the fastening holes. Drill the fastening holes in the side panel, and fasten the filter rack in place with metal screws. Proceed with duct work.

RETURN AIR (175 and 200 MODELS ONLY)

If the return air is to enter the furnace from the sides, use the optional side filter rack. It will be necessary to cut the return air opening in the side casing panel. Center the filter rack on the side panel, flush with the bottom edge of the furnace. With the filter removed, mark the opening to be cut, also mark the fastening holes. Cut the opening in the sides and drill the fastening holes in the side panel. Fasten the filter rack in place with metal screws. Proceed with duct work.

FILTERS FOR ALL FURNACES:

The filters supplied with the optional filter rack should be used or they should be field supplied filters of the permanent type. Refer to the following table for filter sizes and minimum filter area (SQ. Inch) required for all furnaces sizes:

INPUT BTU/HR	FILTER REQUIREMENTS (HEATING)*		
	FILTER NUMBER AND SIZE		MINIMUM FILTER AREA (SQ. INCH)
	PERMANENT**	OPTIONAL PACKAGE	
55,000	(1) 10x25x1	(1) 20x25x1	180
80,000	(1) 14x25x1	(1) 20x25x1	260
100,000	(1) 16x25x1	(1) 20x25x1	320
125,000	(1) 16x25x1	(1) 20x25x1	400
150,000	(1) 20x25x1	(1) 20x25x1	480
175,000	(2) 16x20x1	(2) 20x25x1	560
200,000	(2) 16x25x1	(2) 20x25x1	640

*FOR COOLING REQUIREMENTS, CONSULT SPECIFICATION SHEET

**FILTERS RATED AT 520 FPM OR MORE

ELECTRICAL CONNECTIONS

These units are 60 HZ wired and require 115 VOLT SINGLE PHASE POWER SUPPLY. Connect 115 Volt power supply and 24 Volt thermostat wires as indicated in the Wiring Diagram, attached to the inside of the blower compartment door, or refer to the diagram inserted in this book. Optional electrical power connections are also shown on the diagram supplied with the furnace.

This unit must be grounded in accordance with the National Electric Code, ANSI-CI-1975.

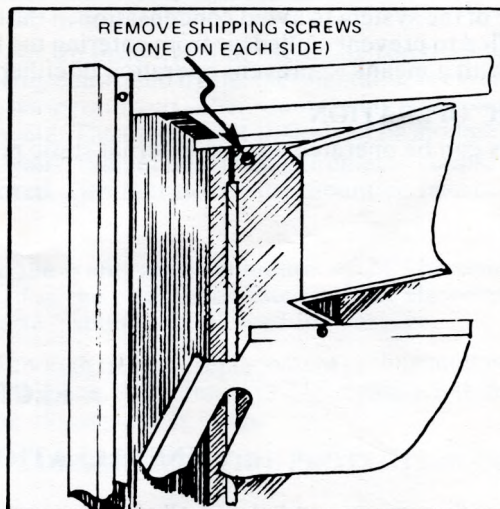
FLUE CONNECTION

Connect a corrosion-resistant flue pipe the same diameter as the draft hood outlet* with sheet metal screws.

Vent the flue to a permanent chimney or a vent pipe of listed design. The flue or vent connector must be inserted into but not beyond the inside wall of the chimney flue. No adjustable restrictors or dampers are to be used in the flue connection, and horizontal runs should not be over 1/3 of the vertical height of the vent or chimney.

Flue pipe connection should slope upward at least 1/4" per foot and should be adequately supported.

*Where two or more appliances vent into a common flue, the area of the common flue should be equal to the sum of the areas of the individual flues.



CAUTION:

Before the unit is put into operation, the two shipping screws located inside the vestibule at the top of the inner panel must be removed. See arrow in sketch # 1. You will find one on the left hand side and one on the right hand side of the draft hood.

GAS PIPING

THESE UNITS ARE SHIPPED WITH THE MANIFOLD AND CONTROLS ASSEMBLED

An opening has been provided on the side for the reception of the piping. Install the gas line from the meter to the unit. Size the pipe as recommended in Table 1 or 3. It is recommended, and many local codes require a manual shut-off valve to be located externally to the unit.

Install a "Tee" in the drop pipe at the same elevation as the gas inlet connection to the unit. At the bottom of the "Tee" install a "drip-trap" and at the top install a ground joint union.

All gas piping must conform with National and Local Codes and Local Utility requirements. Upon completion of piping, check for leaks with a soapy water solution. CAUTION: DO NOT USE OPEN FLAME.

CAUTION:

Use pipe compounds on gas pipe threads that are resistant to all gases.

TABLE 1
Capacity of Iron Pipe in Cubic Feet of Gas Per Hour
 (Based on a Pressure Drop of 0.3 inches water column, 0.60 specific gravity)

Nominal Iron Pipe Size Inches	Length in Feet											
	15	30	45	60	75	90	105	120	150	180	210	240
1/2	76	52	43	38								
3/4	172	120	99	86	77	70	65					
1	345	241	199	173	155	141	131	120	109	100	92	
1-1/4	750	535	435	380	345	310	285	270	242	225	205	190
1-1/2	1220	850	700	610	545	490	450	420	380	350	320	300
2	2480	1780	1475	1290	1120	1000	920	860	780	720	660	620

TABLE 2
Multipliers to be used when Specific Gravity is Other than 0.60

Spec. Grav.	Mult.	Spec. Grav.	Mult.	Spec. Grav.	Mult.	Spec. Grav.	Mult.
.35	1.31	.65	.962	1.00	.775	1.60	.612
.40	1.23	.70	.926	1.10	.740	1.70	.594
.45	1.16	.75	.895	1.20	.707	1.80	.577
.50	1.10	.80	.867	1.30	.680	1.90	.565
.55	1.04	.85	.841	1.40	.655	2.00	.547
.60	1.00	.90	.817	1.50	.633	2.10	.535

TABLE 3
Capacity of Semi-Rigid Tubing in 1000 BTU Per Hour of
Undiluted Liquefied Petroleum Gases of 0.50 Pressure Drop

Outside Dia. Inches	Length of Tubing (Feet)									
	10	20	30	40	50	60	70	80	90	100
3/8	39	26	21	19						
1/2	92	62	50	41	37	35	31	29	27	26
5/8	199	131	107	90	79	72	67	62	59	55
3/4	329	216	181	145	131	121	112	104	95	90
7/8	501	346	277	233	198	187	164	155	146	138

NOTES

1. Allowance has been made for an average number of fittings.
2. When using a gas with a specific gravity other than 0.60, multiply the capacity by the factor given in Table 2.
3. To convert BTU input per hour to cubic feet per hour, divide BTU per hour by the heating value of the gas to be used. This can be obtained from your local utility.
4. Piping systems of semi-rigid tubing (Table 3) that are to be supplied with gas of a specific gravity of 1.53 or less can be sized directly from Table 3 unless the authority having jurisdiction specifies that a gravity factor be applied. When the specific gravity of the gas is greater than 1.53, the gravity factor shall be applied.

SECTION III

FINAL ADJUSTMENTS

PRESSURE REGULATOR ADJUSTMENT

A pressure tap has been provided on the gas valve. Attach a pressure gauge to this tap and check the pressure. The pressure should be set as follows unless otherwise specified by the Local Utility:

Natural Gas	3-1/2" Water Column
Propane Gas	11" Water Column

To adjust the pressure regulator, remove the cap covering the pressure regulator adjusting screw. Turn the adjusting screw out to decrease the pressure and in to increase the pressure. After the pressure regulator has been adjusted to its proper value, check the input by the following formula:

INPUT IN BTU/HR =

$$\frac{\text{Heating value of gas in BTU-Per-CU. ft.} \times 3600 \times \text{CU. Ft. gas measured}}{\text{Time in seconds for CU. ft. of gas measured}}$$

If the input does not correspond to that shown on the rating plate, adjust the input with the regulator screw of the pressure regulator until the rating plate input is obtained. The pressure in the manifold should not vary more than plus or minus 0.3 inches of water column from that specified. Any necessary major changes in the flow should be made by changing the size of the burner orifices.

HIGH ALTITUDE INSTALLATION

These units may be used at full input rating when installed at altitudes up to 2000 feet. When installed above 2000 feet, the input must be decreased 4% for each 1000 feet above sea level.

PRIMARY AIR ADJUSTMENT (Air Shutter)

These units have individual primary air shutters on each burner. To adjust, loosen the lock screw and close the air shutter until yellow tips appear on the flames, then open the air shutter until the yellow tips just disappear, and tighten the lock screw. Follow this procedure on each burner.

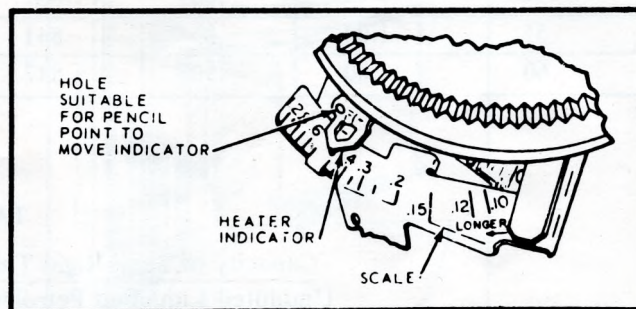
THERMOSTAT ANTICIPATOR SETTING

The proper thermostat heat anticipator setting is the amp. rating on the gas control valve; for standing pilot systems or for special systems, as indicated on a label attached to the furnace. To increase length of cycle increase setting of heat scale; and to decrease length of cycle, decrease setting of heater scale.

Proper control of the indoor area temperature can only be achieved if the thermostat is calibrated to the heating and/or cooling system. A vital consideration of this calibration is related to the thermostat heat anticipator.

Anticipators for the cooling operation are generally preset by the thermostat manufacturer and require no adjustment. Anticipators for the heating operation are of two types: pre-set or adjustable. Those that are pre-set will not have an adjustable scale and are generally marked accordingly.

Thermostat models having a scale as shown in the sketch must be adjusted to each application.



In many cases, this adjustment setting can be found in the unit Installation Instructions. If this information is not available, or if the correct setting is questioned, the below procedure should be followed:

STEP 1. Wrap 10 loops of single strand, insulated thermostat wire around the prongs of an amprobe. Set the amprobe to the 1 to 5 or 1 to 6 amp. scale.

STEP 2. Connect the uninsulated ends of this wire jumper across terminals "R" and "W" on the sub-base ("RH" and "W", on multi-stage thermostat sub-base). See sketch on page 6. This test must be performed without the thermostat attached to the sub-base.

STEP 3. Let the heating system operate in this position for about one minute. Read the amprobe scale. Whatever reading is indicated must be divided by 10 (for 10 loops of wire). This is the setting at which the adjustable heat anticipator should be set.

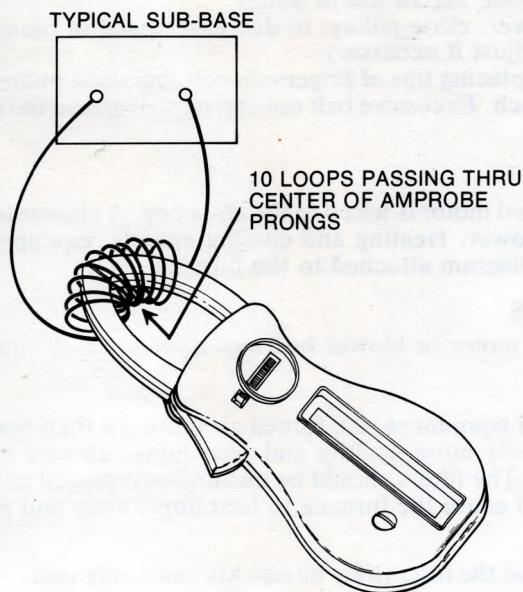
FORMULA:
$$\frac{\text{Amprobe reading}}{10 \text{ loops}} = \text{Anticipator Setting}$$

OR:
$$\frac{2.5 \text{ Amps}}{10} = .25 \text{ AMPS Setting}$$

STEP 4. If a slightly longer cycle is desired, the pointer should be moved to a higher setting. Slightly shorter cycles can be achieved by moving to a lower setting.

STEP 5. Remove the amprobe jumper wire and reconnect the thermostat. Check the thermostat in the heating mode for proper operation.

NOTE: The length of the heating cycle can also be affected by the fan limit control settings (if applicable). The fan "on and off" settings should be checked at this point.



For thermostats having 2 stage heat, step 1, 2, and 3 must be repeated. Second stage heat is controlled through terminals "RH" and "W₂" on the sub-base.

NOTICE TO INSTALLER — Instruct the owner or operator of the furnace in the proper procedure to follow for shutting off the furnace in case of emergency. Explain how to change, service or clean filters and setting of controls for best comfort conditions. Show the owner where the lighting instruction label is located and explain lighting procedure.

SECTION IV

OPERATION AND MAINTENANCE

LIGHTING INSTRUCTIONS

Since there is a variable in the kind and type of controls furnished and installed on different models of furnaces, it is recommended that lighting instructions be followed as they are applied to the unit.

These instructions are detailed, and fastened in the burner vestibule compartment.

Follow the recommended procedure step by step carefully.

This also applies to the shut-down recommendations.

Note: Gas valves may have several methods of actuating their opening when energized. If the gas valve is delayed opening type, it requires about 30 seconds to open or close after being energized or de-energized.

THERMOSTAT

These units are equipped with a Thermostat designed to provide the utmost in heating comfort, and are also designed to be attractive in appearance.

Please remember that these controls are precision devices, and therefore should be handled accordingly. Also, remember that the Thermostat will be affected by any heat source, so do not place lamps, radio, TV, etc., so that heat from these sources can affect the Thermostat operation.

TEMPERATURE SELECTION

To select the temperature control point, move the temperature selection dial until the pointer is in line with the desired point on the temperature scale. The thermometer pointer will not change position on the temperature scale when the temperature selection lever is moved, but will change position as room temperature varies.

FAN AND LIMIT CONTROL

The Fan and Limit Controls are mounted in their proper location. The limit is set at the correct setting. This setting is the point at which the Limit Switch opens contact. The switch is automatic-reset and will make contact when the temperature of the element drops. On installations with adjustable fan controls, the settings should not exceed 140° on and 90° off. On units equipped with Camstat controls, pointer setting indicates OFF temperature. For best results, it should be set at 100° marking.

CAUTION: DO NOT TAMPER WITH THE INTERNAL FAN OR LIMIT CONTROL MECHANISM

BLOWER SPEED ADJUSTMENT (BELT DRIVE MODELS)

The furnace blower must be adjusted to deliver an air quantity (CFM) comparable to the air temperature rise range and the measured total external static pressure as indicated for the appropriate furnace as described on the rating plate. If it is necessary to adjust the blower speed, it can be done by means of the adjustable pulley as follows:

1. Loosen set screws in outside hub of motor pulley.
2. To increase speed of blower, close pulley; to decrease speed of blower, open pulley. Tighten set screw.
3. Check belt tension and adjust if necessary.

Check for proper belt tension by placing tips of fingers on belt (between pulleys) and exerting moderate pressure to depress belt approximately one inch. Excessive belt tension may overload the motor, cause bearing wear and create undesirable noise.

DIRECT DRIVE BLOWER

On heating only models, the 2 speed motor is wired to the Hi-speed. A change to low speed may be made in the lower electrical box attached to the blower. Heating and cooling models, equipped with blower relay, change speeds automatically. Refer to Wiring Diagram attached to the furnace.

LUBRICATION INSTRUCTIONS

For Lubrication Instructions for motor or blower bearings refer to labels attached to blower housing.

FILTERS

If filters are provided as standard equipment, the forced air units are then equipped with efficient viscous type air filters designed to keep your family more healthy and your house cleaner by withholding dirt and other foreign particles from the air circulation. The filters should be cleaned or replaced at least twice a year or at any time they become clogged. Dirty filters will cause the furnace to heat improperly and possible overheat by holding back air circulation.

These furnaces are designed so that the filters may be quickly and easily replaced. Replacement filters must be of the same type and size.

FURNACE CLEANING

Your heating system, like anything mechanical, will give you best comfort performance when it is properly adjusted, correctly operated, and given regular careful maintenance. Because the modern heating plant is so automatic in operation, the modern home owner has a tendency to forget it is in his home. Your furnace will require occasional inspection, adjustment, and cleaning in order to enable it to provide you with year after year of indoor comfort at minimum operation expense.

BALANCING THE SYSTEM

There is one adjustment of your heating system that you are in a position to do more satisfactorily than anyone else. This is the balancing of the system to provide equal comfort in every room. Best balancing is done on a typical cold day. Proceed as follows:

1. Be sure that dampers or valves in pipes or register are wide open in all runs to the room or rooms that seem a little cool.
2. It is best to do this balancing in the evening after sundown.
3. The room thermostat should be left at one setting for several hours before you attempt to do any balancing.
4. Check the temperature in all rooms, you can do this with a thermometer.
5. In the room or rooms that are too warm, turn down the register valve.
6. Wait several hours until room comfort balances out at this new setting and then recheck temperature.
7. By doing the adjusting a little at a time, you will accomplish the temperature balance you want. After a pipe damper or register valve has been adjusted it takes time for the temperature to conform with the new setting. By adjusting a little at a time, you will soon accomplish better system balance than can be done by anyone else who does not live in the house.

EMERGENCY SERVICE

In case of operating difficulty, check the following items before calling for service:

1. Make sure thermostat is set above room temperature.
2. Make visual check to make sure pilot is burning.
3. If pilot is burning, make sure hand valve is in "on" position. (See instruction plate).
4. If pilot is not burning, shut down unit according to instruction plate, wait 5 minutes, and light pilot following instructions on instruction plate.
5. Make sure line switch is "on" and that fuse is not blown.
6. Make sure air filter is clean.

If difficulty still exists, call your SINGER installer.